NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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Flood Insurance Rate Map

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FLOOD INSURANCE STUDY

STOKES COUNTY,
UNINCORPORATED AREAS,
NORTH CAROLINA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Stokes County, North Carolina, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey (USGS) (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 16. This study was completed in July 1986.

1.3 Coordination

On September 23, 1987, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Stokes County, North Carolina. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

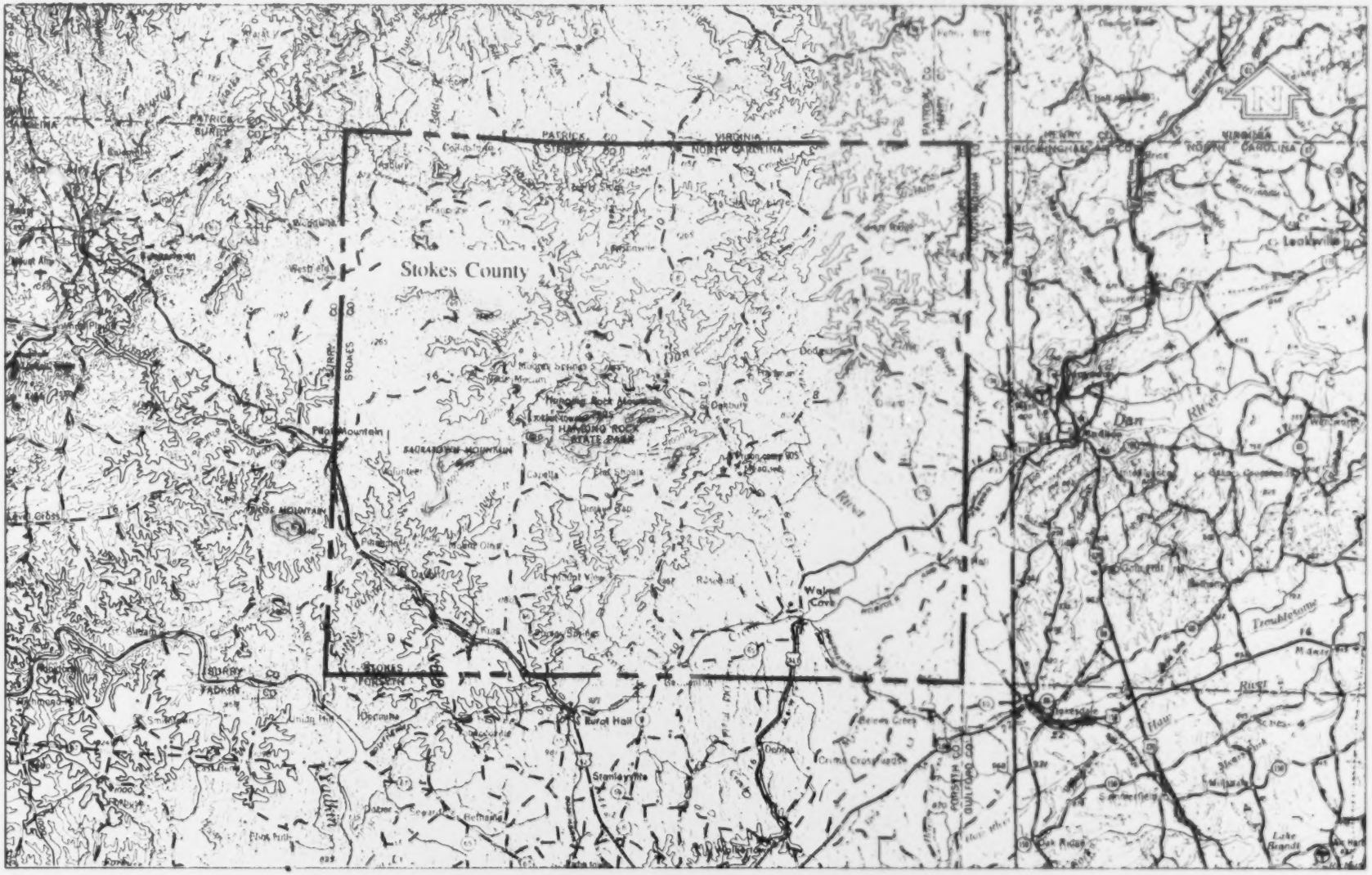

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

STOKES COUNTY, NC
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

5 0 5 10 15 MILES

VICINITY MAP

Flooding caused by overflow of the Dan River and Crooked Run Creek was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for Stokes County, North Carolina (Reference 1) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through July 1991. The scope and methods of study were proposed to and agreed upon by FEMA and Stokes County.

2.2 Community Description

Stokes County is in north-central North Carolina and is bordered on the north by Patrick and Henry Counties, Virginia; on the east by Rockingham County, North Carolina; on the south by Forsyth County, North Carolina; and on the west by Surry County, North Carolina. Stokes County is served by U.S. Routes 52 and 311, State Roads 8, 65, 66, 89, 268, 704, and 772, and the Norfolk Southern Railway. The 1980 population of Stokes County was reported to be 8,757 (Reference 2).

2.3 Principal Flood Problems

The Dan River is a moderately-sized stream draining approximately 500 square miles as it leaves the county; most of the other streams are relatively small, steep, and swift flowing. Floods can occur at any time during the year, but major floods are more likely to occur during the hurricane season: July to November. The largest flood recorded at the USGS stream gage located on the Dan River just upstream of the bridge on State Road 704, approximately nine miles upstream from Dan River Shores, occurred August 17, 1985. The peak discharge of that flood was 21,200 cubic feet per second (cfs). Based on a frequency analysis of annual peaks collected at the gage since 1925, the August 1985 flood has a recurrence interval of 160 years. Other large floods on the Dan River occurred in September 1979 (discharge 18,900 cfs) and 1916 (discharge 16,000 cfs). Long-time residents in the Crooked Run Creek area reported that the August 1985 flood was the largest they had ever seen. No frequency data for Crooked Run Creek were available.

2.4 Flood Protection Measures

There are no known flood protection measures on the Dan River. On Crooked Run Creek, there is a U.S. Soil Conservation Service flood control dam designed to control the 100-year flood with a design release rate of 116 cfs. The dam controls drainage from 2.2 square miles. It was reported that the dam was overtopped during the August 1985 flood.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Equations have been developed for estimating peak flows on rural streams in North Carolina (Reference 3). Land use for the Crooked Run Creek watershed was determined from topographic maps and field inspection (Reference 4). The rural equation was used for Crooked Run Creek to estimate the 100-year flood discharge. The equation has only one parameter, drainage area, for estimating the 100-year discharge; therefore, to use the equation to compute the 100-year discharge at points on Crooked Run Creek, the drainage area of the flood control dam was subtracted from the total drainage area and the design release rate of 116 cfs was added to obtain the 100-year discharge at the point.

The 100-year peak discharge for the Dan River at Dan River Shores was computed by transferring data from the USGS gage at State Road 704. The 100-year discharge at the USGS gage is based on a flood-frequency analysis of annual peaks computed using the guidelines outlined in Bulletin No. 17B (Reference 5).

Peak discharge-drainage area relationships for the 100-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 100-YEAR
CROOKED RUN CREEK		
at county boundary	4.90	1,430
about 1,650 feet upstream of county boundary	4.73	1,380
just downstream of SR 1105	4.58	1,330
at SR 1105	2.77	610
DAN RIVER		
at State Road 704	124	18,800

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

For Crooked Run Creek, water-surface elevations of the 100-year flood were computed by step-backwater analyses using the USGS E431 and J635 computer programs (References 6 and 7). Cross sections of the floodplain and channel were field surveyed.

For the Dan River, the 100-year profile was based on a flood profile of the August 1985 flood (recurrence interval 160 years) determined by a transitstadia survey of high-water marks. A slope-conveyance rating, computed using the surveyed cross section and the flood elevation and discharge of the August 1985 flood, was used to estimate the elevation of the 100-year flood. The computation showed the 100-year flood to be 1.4 feet lower than the August flood and the profile was adjusted by that amount.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations. The starting elevation for the step-backwater computations was computed using the estimated 100-year discharge and slope estimated from the profile of the streambed.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus

considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 20 feet (Reference 4).

The 100-year floodplain boundary is shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for Stokes County (Reference 1).

4.2 Floodways

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

Floodways have not been shown or computed for this community. Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

Flood Insurance Studies published for Forsyth and Surry Counties, North Carolina, and Henry and Patrick Counties, Virginia (References 8-11) are in agreement with this study.

Flood Insurance Rate Maps printed for the Town of Danbury and the Town of Walnut Cove, North Carolina (References 12 and 13) are in agreement with this study.

A Flood Insurance Study in progress for the City of King, North Carolina (Reference 14) is in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Stokes County (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Stokes County, Unincorporated Areas, North Carolina, March 1979.

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, North Carolina, Washington, D.C., February 1982.

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4. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 Feet: Ayersville, North Carolina, 1971; Belews Lake, North Carolina, 1971; Danbury, North Carolina, 1971; Hanging Rock, North Carolina, 1971; King, North Carolina; 1971, Pinnacle, North Carolina, 1971; Pilot Mountain, North Carolina, 1971; Spencer, Virginia-North Carolina, 1967; Walnut Cover, North Carolina, 1971.

5. U.S. Department of the Interior, Geological Survey, Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, September 1981, revised March 1982.

6. ————, Geological Survey, Open-File Report, Computer Program E431, Users Manual, Computer Applications for Step-Backwater and Floodway Analyses, James O. Shearman, Washington, D.C., 1976.

7. U.S. Geological Survey, User's Guide, Step-Backwater and Floodway Analyses, J.O. Shearman, May 1977.

8. Federal Emergency Management Agency, Flood Insurance Study, Forsyth County, Unincorporated Areas, North Carolina, January 1984.

9. ————, Flood Insurance Study, Surry County, Unincorporated Areas, North Carolina, December 1981.

10. ————, Federal Insurance Administration, Flood Insurance Study, Henry County, Unincorporated Areas, Virginia, November 1980.

11. ————, Flood Insurance Study, Patrick County, Unincorporated Areas, Virginia, May 1984.

12. ————, Flood Insurance Rate Map, Town of Danbury, Stokes County, North Carolina, July 1987.

13. ————, Flood Insurance Rate Map, Town of Walnut Cove, Stokes County, North Carolina, June 1986.

14. ————, Flood Insurance Study, City of King, Stokes County, North Carolina, in progress.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0060	737.04	bolt driven about 2 feet above ground in north side of power pole located 100 feet upstream of intersection of SR 1486 and dirt road paralleling the Dan River
2	0060	744.13	railroad spike in power pole located about 35 feet west of dirt road paralleling the Dan River, 2,200 feet upstream of intersection of dirt road and SR 1486

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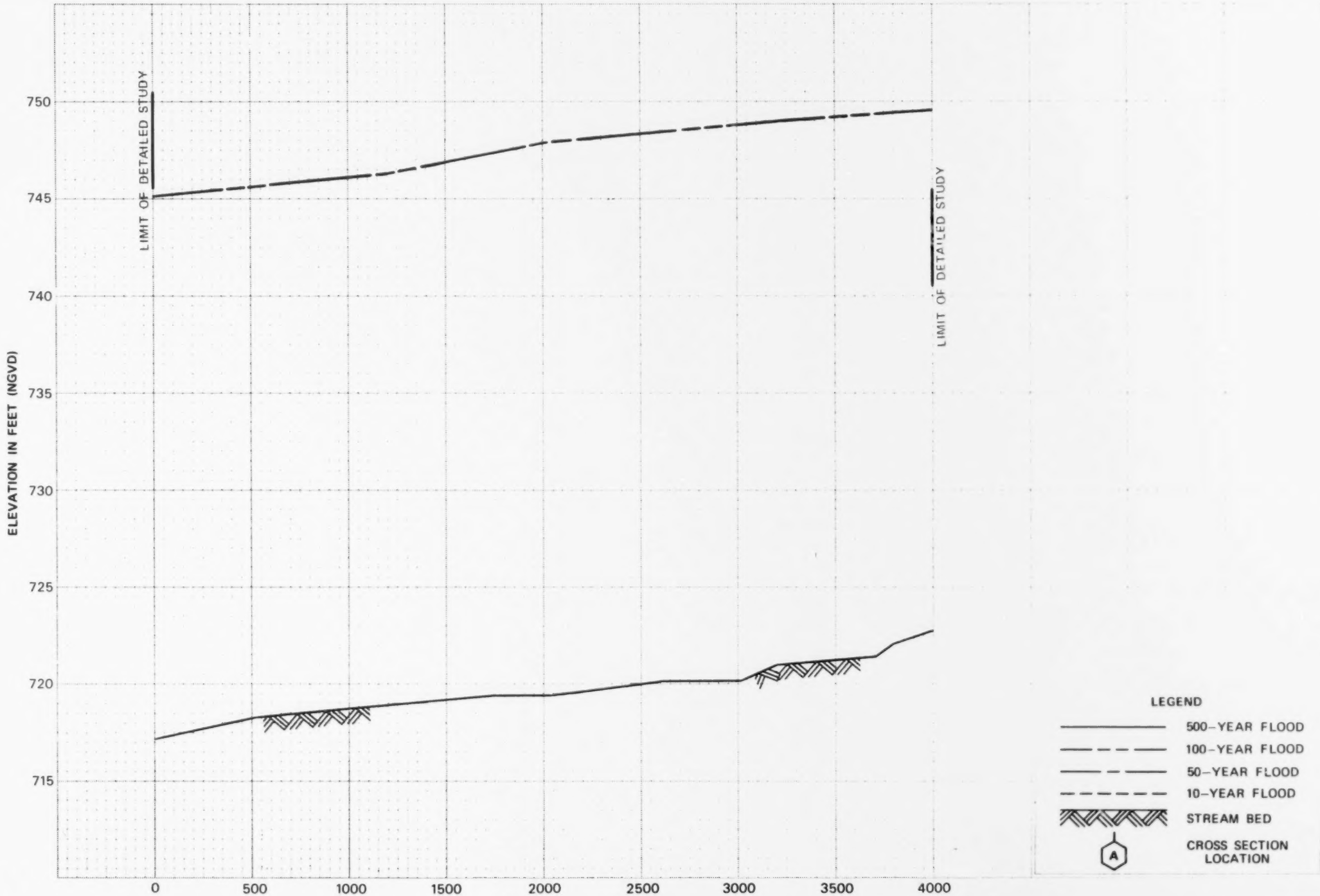


FLOOD PROFILES

DAN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

STOKES COUNTY, NC
(UNINCORPORATED AREAS)

01P

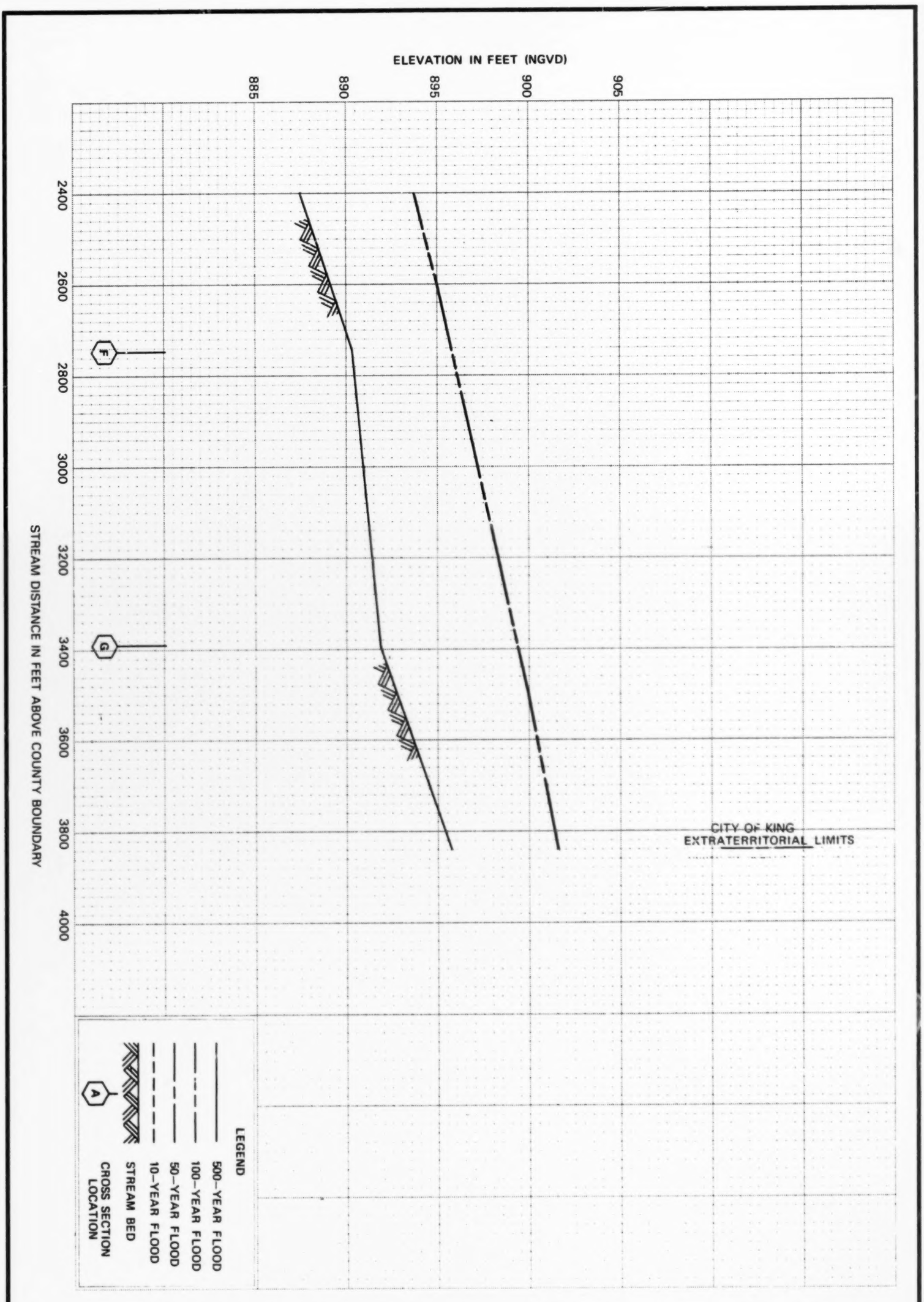
FLOOD PROFILES

CROOKED RUN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

STOKES COUNTY, NC
(UNINCORPORATED AREAS)

02P



03P

FEDERAL EMERGENCY MANAGEMENT AGENCY

STOKES COUNTY, NC
(UNINCORPORATED AREAS)

FLOOD PROFILES

CROOKED RUN CREEK